

# Transverse $\epsilon$ measurement

$$\epsilon^* = \frac{6\sigma^2\beta\gamma}{\beta_{Latt}}$$

- Goal of the study
  - : to check the performance of the instrument & beam growth.
- Flying wires installed in the MI
  - : horizontal & vertical wires

# Flying Wire System

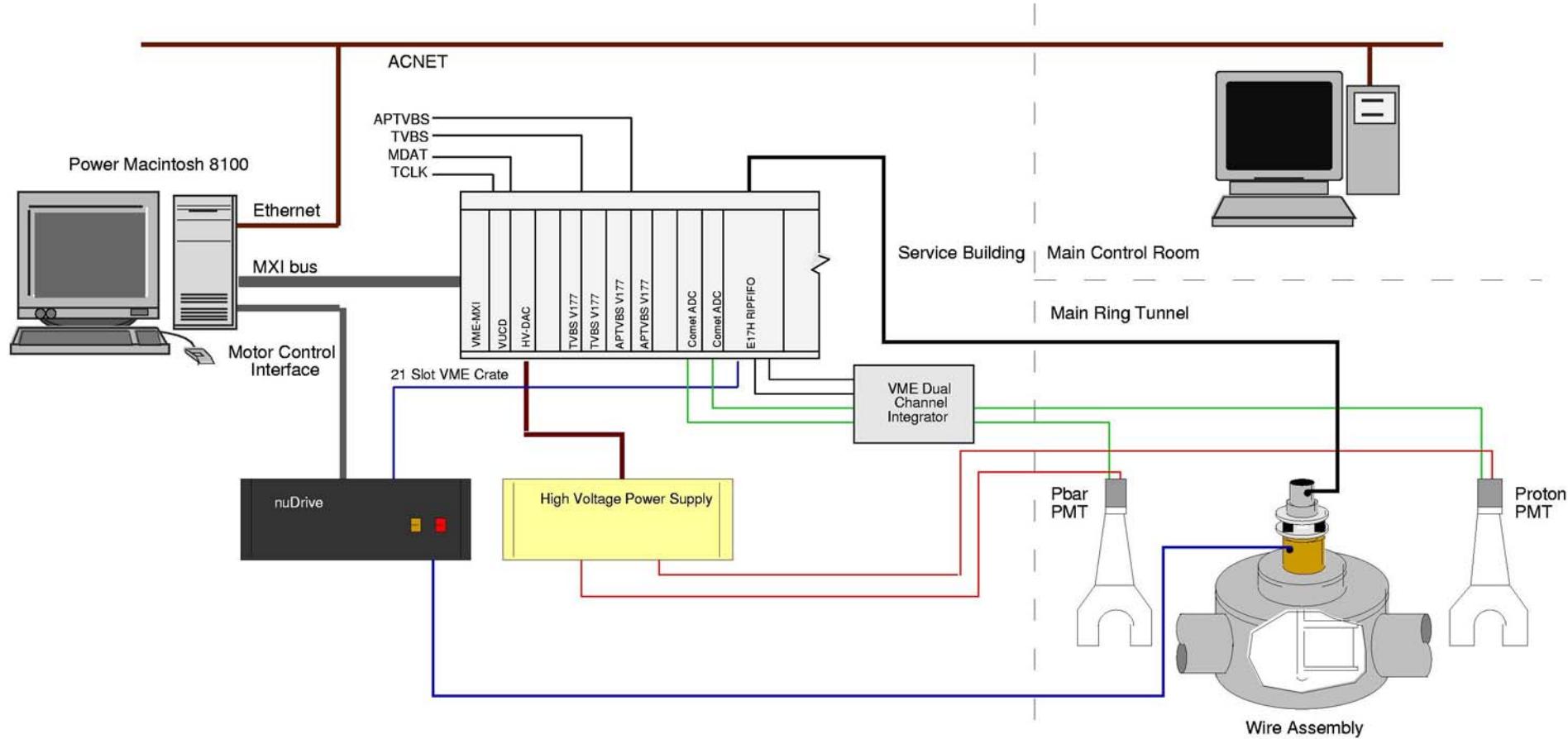
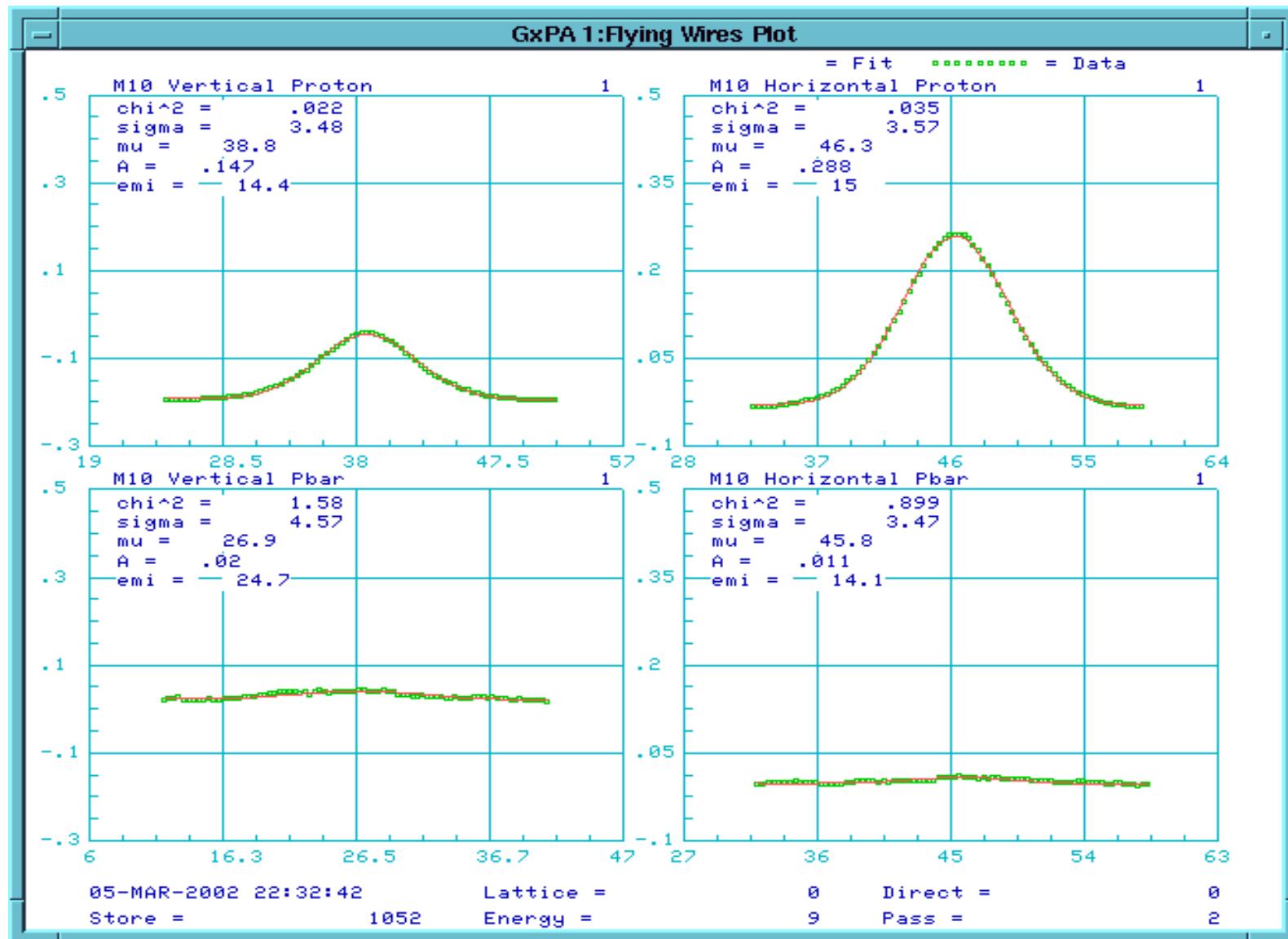


Figure 1. Single Wire Configuration.

Wire speed  $\sim 5 \text{ m/s}$

- measure the beam intensity distribution in  $x-x'$  space.
- fit the intensity distribution with a gaussian fn : getting  $\sigma$  from the fn
- scintillator-PMT assembly for proton beam was replaced in July

# Flying Wire profiles



- **Result :**
  - Both Hor. & Vert  $\epsilon$  grow as energy increases
    - : previous meas. shows a growth only in Hor.  $\epsilon$
  - Vertical  $\epsilon$  is different for the same beam
    - : data from pass 1 & 2 shows a discrepancy
  - Vertical  $\epsilon$  has a large measurement error at high energy.

## \$29 cycle : Measurement before the replacement

Time	Intensity	Vert. HV	Vertical Emittance	Hor. HV	Horizontal Emittance
\$80, delay 0.1 s	2e12	1000 V	13.00±0.36	1000 V	14.66±0.23
\$80, delay 0.1 s	4.3e12	750 V	16.99±0.54	750 V	18.59±0.32
\$80, delay 0.1 s	4.3e12	800 V	16.92±0.36	800 V	18.68±0.17
\$80, delay 0.1 s	4.3e12	980 V	16.61±0.58	980 V	18.7±0.30
\$29, delay 0.51 s	0.3e12	950 V	9.44±1.00	850 V	11.19±0.61
\$29, delay 0.51 s	0.8e12	900 V	10.33±1.09	820 V	12.26±0.16
\$29, delay 0.51 s	2e12	800 V	12.9±2.1	720 V	14.96±0.28
\$29, delay 0.45 s	4.3e12	800 V	16.3±4.7	650 V	22.44±0.84
\$29, delay 0.51 s	4.3e12	720 V	16.2±4.2	650 V	22.72±0.81

## \$29 cycle : 8-14-02

Type & Delay Time	Intensity	Vert HV	Vert $\epsilon$	Hor HV	Hor $\epsilon$
\$80, 0.1 (8 GeV)	$\sim 4.5 \text{ e}12$	670	$14.4 \pm 0.34$	800	$15.83 \pm 0.29$
\$29, 0.45 (120)	$\sim 4.5 \text{ e}12$	500	$19.76 \pm 4.22$	600	$20.24 \pm 0.59$
\$29, 0.45	$\sim 4.5 \text{ e}12$	550	$21.38 \pm 3.49$	600	$20.23 \pm 0.65$
\$29, 0.51	$\sim 4.5 \text{ e}12$	550	$18.8 \pm 2.44$	600	$20.33 \pm 0.55$

- To do
  - 1) diagnose problems with the vertical flying wire
    - : currently horizontal wire flies first.
    - : fly only the vertical wire
    - : PMT replacement (?)
  - 2) find out where the beam growth happens